Sinus of Valsalva Aneurysm as a Cause of Acute Myocardial Infarction
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INTRODUCTION
Sinus of Valsalva aneurysm (SVA) is a very infrequent cardiac anomaly (0.14-0.96% of cases of open-heart surgery).

Aneurysmal dilatation of one or more of the sinuses of Valsalva (SVA) is a rare cause of coronary insufficiency. We describe one case of unruptured and partially thrombosed right sinus of Valsalva aneurysm of which the first sign was acute inferior myocardial infarction in a 40-year-old man while reviewing the literature, we found 44 reported cases of sinus of Valsalva aneurysm, complicated by myocardial ischemia or infarction. In 28 cases the left coronary sinus was involved, in 12 cases the right one, and in 4 cases both of them. Myocardial ischemia is a potentially ominous prognostic sign in SVA patients. The poor outcome with conservative treatment leads us to consider the patient for emergency surgical therapy.

Key words: Aneurysm. Valsalva. Ischemia. Myocardial infarction.

CLINICAL CASE
The patient was a 40-year-old white male who smoked, but had no other coronary risk factors. In childhood he had been advised of the presence of a systolic murmur, but until the day of admission it had been asymptomatic and had not been studied. The patient came to the hospital with prolonged chest pain that had appeared suddenly while at rest. In the emergency room he was diagnosed as inferior AMI with clinical and electrocardiographic criteria, which later was confirmed by the demonstration of enzyme elevation (CPK 3495, MB 362). The clinical evolution was uncomplicated and 7 days after admission the patient was transferred to our service for complete study. In the physical examination his blood pressure was 100/60 mm Hg and he had a precordial systolic ejection murmur, grade 3/6. The ECG showed sinus rhythm, 65 beats/min, with a QS pattern and negative T waves in leads III and aVF. The chest X-ray exam was normal. Transthoracic echocardiography showed a tricuspid aortic valve and a partially thrombosed anterior sinus of Valsalva aneurysm. The left ventricle was dilated (end-diastolic diameter

Aneurisma del seno de Valsalva como causa de un infarto agudo de miocardio

La dilatación aneurismática de uno o más de los senos de Valsalva (ASV) es una causa rara de insuficiencia coronaria. Describimos un caso de aneurisma de seno de Valsalva derecho, parcialmente trombosado y no roto, en un varón de 40 años, cuya primera manifestación fue un infarto agudo de miocardio inferior. En una revisión de la bibliografía hemos encontrado 44 casos descritos de ASV como causa de isquemia o infarto de miocardio: en 28 casos el seno de Valsalva implicado era el izquierdo, en 12 casos el derecho y en 4 casos ambos. La aparición de isquemia miocárdica en pacientes con ASV es un signo de mal pronóstico. La mala evolución con tratamiento conservador lleva a considerar la intervención quirúrgica urgente.

Palabras clave: Aneurisma. Valsalva. Isquemia. Infarto de miocardio.

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The right sinus of Valsalva presented an aneurysmal dilatation (35 mm in diameter). The aneurysm forms a digitiform protrusion into the right atrium. The lower intensity of the contrast in the aneurysmal lumen is due to the presence of a thrombus. On the left side of the figure, the lesion-free right coronary artery is visible. Selective catheterization was not possible.

The patient underwent surgery with extracorporeal bypass from the aorta to the right coronary artery. Surgical correction included closure of the right coronary ostium with two interrupted stitches, reconstruction of the ascending aorta with a Dacron patch and implantation of a saphenous vein graft bypass from the aorta to the right coronary artery. The postoperative course was uneventful and the patient is alive and asymptomatic after 2 years of follow-up.

DISCUSSION

SVA can be acquired, secondary to infectious processes, degenerative, or traumatic. In these cases there is diffuse dilatation of the sinus of Valsalva, which can affect any single sinus, two or three sinuses at the same time, the ascending aorta, and even project into the pericardium. However, most cases are congenital SVA due to a defect in the aortic wall behind the sinus of Valsalva, consisting of a lack of continuity between the aortic media and valve annulus. In these cases, the right coronary sinus is most frequently affected (70% of cases) and the aneurysm usually forms digitiform protrusions into the atrium and/or right ventricle. The non-coronary sinus is affected in 29% of cases, and involvement of the left coronary sinus is exceptional.3,5 Congenital SVA may be associated with septal or valve defects.

The most frequent complication of SVA is rupture, opening into the right atrium or ventricle or, as occurs in some acquired cases, the pleural or pericardial cavity. The diagnosis of ruptured SVA is relatively easy to establish because of the severe clinical picture that accompanies the condition. However, diagnosing a SVA before rupture is much less likely because it is usually silent. An unruptured SVA shows no clinical manifestations when it becomes infected, produces embolism, or compresses neighboring structures during its expansion. The most frequent complications are obstruction of the right ventricular outflow tract, aortic regurgitation, conduction disorders, and, more rarely, myocardial ischemia due to compression of the coronary arteries (Table 1).

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The reduction of coronary flow due to SVA is an uncommon manifestation. In these cases, affection of the coronary circulation can be potentially lethal because aneurysmal expansion may be very rapid, so emergency surgery must be considered. There is more risk of myocardial ischemia with left SVA than with right SVA. The reason for this may be that the central part of the left atrial coronary sinus is directly exposed to the pericardium and aneurysms originating here can protrude between the left atrium and pulmonary trunk, compressing the trunk and branches of the left coronary artery. In contrast, obstruction of the ostium of the right coronary artery is usually due to the presence of a thrombus or syphilitic involvement, and

66 mm), with mild inferior hypokinesia and an ejection fraction of 52%. Transesophageal echocardiography confirmed the presence of an aneurysm (57 x 55 mm) that was partially filled with thrombotic material and protruded into the right chamber (Figure 1). No intracardiac shunting or aortic regurgitation was detected. Coronary angiography (Figure 2) showed a partly thrombosed right SVA (55 x 35 mm diameter in the left anterior oblique view and 41 x 41 mm in the right anterior oblique view); the coronary arteries had no atherosclerotic lesions. No possible causes of acquired SVA were detected.

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less frequently to mechanical deformation of the os-
tium and/or proximal compression.

In our case, the SVA was probably congenital (pos-
sible acquired causes were excluded) and the first cli-
nical manifestation was inferior AMI. In the interna-
tional literature, only 44 cases of SVA accompanied
by myocardial ischemia or necrosis have been repor-
ted. Of them, 28 involved the left sinus of Valsalva, 12
the right sinus, and 4 both. AMI was the first clinical
manifestation in 14 of the 28 cases of left SVA, but
only in 3 of the 12 right SVA (Table 1). Our patient,
consequently, is the fourth case in which AMI was the
first manifestation of an unruptured right SVA and
the first described in the Spanish literature.

Myocardial ischemia secondary to SVA can be a
sign of poor prognosis. As indicated by Faillace et al.,
aneurysmal dilatation may occur very rapidly, and
eyarly diagnosis and surgical treatment is mandatory.
The surgical technique depends on the anatomical
constraints and ranges from a simple patch closing the
aneurysmal orifice to complete reconstruction of the
aortic root. The prognosis seems to improve if aortic
valve replacement and aortocoronary bypass can be
avoided. After surgical repair, the prognosis is
usually good and the risk of recurrence is rare.

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et al. An unruptured aneurysm in the right sinus of Valsalva pre-
onary compression and unstable angina; successful repair by iso-

TABLE 1. Cases of acute myocardial infarction as a manifestation of aneurysm of the sinus of Valsalva

<table>
<thead>
<tr>
<th>Author and bibliographic</th>
<th>Sinus involved</th>
<th>Mechanism</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipps, 1941</td>
<td>Left</td>
<td>Compression of LCT, DA and CX</td>
<td>Rupture</td>
</tr>
<tr>
<td>Traffelet, 1957</td>
<td>Right</td>
<td>Occlusion of proximal RC</td>
<td></td>
</tr>
<tr>
<td>Eliot, 1963</td>
<td>Left</td>
<td>Compression of LCT, DA and CX</td>
<td>Bicuspid AoV</td>
</tr>
<tr>
<td>Olsen, 1969</td>
<td>Left</td>
<td>Compression of DA</td>
<td>Calcified AoS. Pneumonia.</td>
</tr>
<tr>
<td>Bulkley, 1975</td>
<td>Right</td>
<td>Occlusive thrombus in the RC ostium</td>
<td>Aol. Sudden death</td>
</tr>
<tr>
<td>Cupo, 1981</td>
<td>Left</td>
<td>Unknown</td>
<td>NCS also aneurysmal</td>
</tr>
<tr>
<td>Hiyamuta, 1983</td>
<td>Left</td>
<td>Compression of LCT and DA</td>
<td>Aol</td>
</tr>
<tr>
<td>Brandt, 1985</td>
<td>Left</td>
<td>Compression of LCT, DA and CX</td>
<td>Previous AoVR</td>
</tr>
<tr>
<td>Ishide, 1985</td>
<td>Right and non-coronary</td>
<td>Compression of RC</td>
<td></td>
</tr>
<tr>
<td>Faillace, 1985</td>
<td>Left</td>
<td>Compression of LCT</td>
<td>Moderate Aol. Weber-Christian disease</td>
</tr>
<tr>
<td>Ince, 1986</td>
<td>Left</td>
<td>Compression of LCT</td>
<td>Aol. Rupture into LV</td>
</tr>
<tr>
<td>Nakano, 1986</td>
<td>Left</td>
<td>Compression of LCT and CX</td>
<td></td>
</tr>
<tr>
<td>Koike, 1991</td>
<td>Left</td>
<td>Partial occlusion of the left coronary</td>
<td>Myocytic aneurysm</td>
</tr>
<tr>
<td>Tahir, 1995</td>
<td>Left</td>
<td>Occlusion DA (anterior LV aneurysm)</td>
<td>Clinical manifestations of angina</td>
</tr>
<tr>
<td>Tall, 1996</td>
<td>Left</td>
<td>Compression of LCT, DA and CX</td>
<td>ALE</td>
</tr>
<tr>
<td>Ferreira, 1996</td>
<td>Left</td>
<td>Compression of CX. Associated vasospasm?</td>
<td>During stress test with dobutamine</td>
</tr>
<tr>
<td>Wiemer, 1996</td>
<td>Left</td>
<td>Compression of DA and CX</td>
<td>Congenital AoS. IE</td>
</tr>
</tbody>
</table>

ALE indicates acute lung edema; AoI, aortic regurgitation; AoS, aortic stenosis; AoV, aortic valve; AoVR, aortic valve replacement; CX, circumflex artery; DA, left descending anterior artery; IE, infectious endocarditis; LA, left atrium; LCT, left coronary trunk; LV, left ventricle; MI, mitral regurgitation; MS, mitral stenosis; NCS, non-coronary sinus; RC, right coronary artery; RV, right ventricle.